Geophysical Research Abstracts
Vol. 18, EGU2016-13843, 2016
EGU General Assembly 2016

Testing of an automated online EA-IRMS method for fast and simultaneous carbon content and stable isotope measurement of aerosol samples

István Major (1), Brigitta Gyökös (2), Marianna Túri (1), István Futó (1), Ágnes Filep (3), András Hoffer (4), and Mihály Molnár (1)

(1) Hertelendi Laboratory of Environmental Studies, MTA ATOMKI, Debrecen, Hungary, (2) University of Debrecen, Faculty of Engineering, Debrecen, Hungary, (3) MTA-SZTE Research Group on Photoacoustic Spectroscopy, University of Szeged, Department of Optics and Quantum Electronics, Szeged, Hungary, (4) MTA-PE, Air Chemistry Research Group, Veszprém, Hungary

Comprehensive atmospheric studies have demonstrated that carbonaceous aerosol is one of the main components of atmospheric particulate matter over Europe. Various methods, considering optical or thermal properties, have been developed for quantification of the accurate amount of both organic and elemental carbon constituents of atmospheric aerosol.
The aim of our work was to develop an alternative fast and easy method for determination of the total carbon content of individual aerosol samples collected on prebaked quartz filters whereby the mass and surface concentration becomes simply computable. We applied the conventional "elemental analyzer (EA) coupled online with an isotope ratio mass spectrometer (IRMS)" technique which is ubiquitously used in mass spectrometry. Using this technique we are able to measure simultaneously the carbon stable isotope ratio of the samples, as well. During the developing process, we compared the EA-IRMS technique with an off-line catalytic combustion method worked out previously at Hertelendi Laboratory of Environmental Studies (HEKAL).
We tested the combined online total carbon content and stable isotope ratio measurement both on standard materials and real aerosol samples. Regarding the test results the novel method assures, on the one hand, at least 95% of carbon recovery yield in a broad total carbon mass range (between 100 and 3000 ug) and, on the other hand, a good reproducibility of stable isotope measurements with an uncertainty of $\pm$ 0.2 per mill. Comparing the total carbon results obtained by the EA-IRMS and the off-line catalytic combustion method we found a very good correlation (R2=0.94) that proves the applicability of both preparation method.
Advantages of the novel method are the fast and simplified sample preparation steps and the fully automated, simultaneous carbon stable isotope ratio measurement processes. Furthermore stable isotope ratio results can effectively be applied in the source apportionment investigations of atmospheric carbonaceous aerosol.
This research was supported by the European Union and the State of Hungary, co-financed by the European Social Fund in the framework of TÁMOP 4.2.4.A/2-11-1-2012-0001 'National Excellence Program.